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Vol. 105 Washington : 1955 No. 3349

NOTES ON SHRIMPS FROM THE MARSHALL ISLANDS

By Fenner A. Chace, Jr.

The collections on which the following notes are based were made during biological surveys of the northern Marshall Atolls of Eniwetok, Bikini, Rongelap, and Rongerik in 1946 and 1947, under the sponsorship of the U. S. Department of the Navy. Only the decapod shrimps of the families Penaeidae, Sergestidae, Pasiphaeidae, Processidae, Thalassocaridae, and the genera *Automate* and *Athanas* of the Alpheidae are included here. Pressure of other work has precluded the possibility of completing the study of the remaining shrimps of these collections in a reasonable length of time. It is hoped that Dr. A. H. Banner of the University of Hawaii will be able to work up the remaining alpheid shrimps; and Dr. L. B. Holthuis of the Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands, has agreed to include those of the families Hippolytidae, Rhynchocinetidae, Palaemonidae, Gnathophyllidae, and Stenopodidae in a forthcoming report on macrurous Crustacea collected by recent expeditions to several of the Pacific island groups.

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Family Penaeidae

Subfamily Penaeinae

Metapenaeopsis sp. ?

Figure 1

Bikini Atoll: 1½ miles south of west end of Bikini Island; 12 fathoms, coral bottom; Apr. 23, 1946; J. P. E. Morrison; 1 male abdomen.

This species may be identical with *Metapenaeopsis dalei* (Rathbun, 1902). Comparison of the petasma (fig. 1) with those of the type specimens of *M. dalei* discloses certain differences, however, such as the form of the left distoventral projection, which is armed with only three teeth in the Bikini specimen and not noticeably curved over the right distoventral projection as in *M. dalei*. The form of the right distoventral projection is also slightly different from those in the types. The petasma of *M. dalei* is figured by Rathbun (1902, fig. 10) and is discussed by Kubo (1949, p. 100, fig. 33). Some of the smallest type specimens of *M. dalei* have the petasmata very similar to that of the present specimen, but they are distinctly different in specimens having petasmata of similar size (about 6 mm. in length). Because of the fragmentary condition of the Bikini specimen, it seems best to defer a specific determination until more specimens are available and until more is known of the distribution and variation of the species of *Metapenaeopsis*.

Subfamily Sicyoniinae

Sicyonia bispinosa (de Haan) ?

Figure 2

? *Hippolyte bispinosus* de Haan, 1844, pl. 45, fig. 9.
? *Sicyonia bispinosa* de Haan, 1849, p. 195.—de Man, 1911a, p. 120, pl. 10, figs. 42–42c.

Rongelap Atoll: Lagoon; 23+ fathoms; June 16, 1946; M. W. Johnson; 2 females.

The larger of these two specimens has the carapace considerably macerated. The smaller specimen has a carapace length of 4.4 mm. (total length about 18.5 mm.). It agrees almost exactly with de Man's description and figure. The only differences noted are the slightly longer lateral carina on the rostrum, which reaches quite to the third rostral tooth, and the form of the ventral rostral tooth, which is directed downward somewhat more than indicated in de Man's figure. Both of these differences may be attributable to the slightly larger size of the present specimen. De Man does not mention, how-

ever, the pronounced excavation of the posterior margin of the pleuron of the fifth abdominal somite (fig. 2,*b*) which appears to be characteristic of the species.

These specimens have the unarmed antennal angle, notched dorsal carina of the second abdominal somite, spinose basis and ischium of

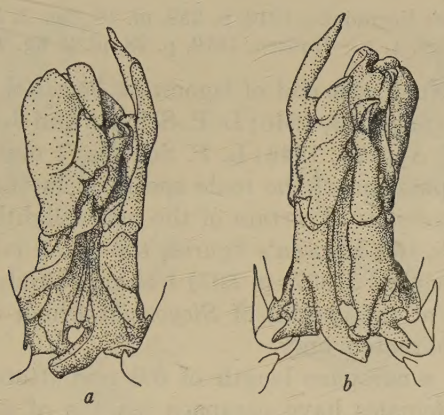

FIGURE 1.—Petasma of *Metapenaeopsis* sp.?: *a*, Posterior view, X 7; *b*, anterior view, X 7.

the first chelipeds, and the typical dorsal armature of the carapace characteristic of Division I or *carinata* group diagnosed by Burkenroad (1934, p. 71) and later abandoned by that author (1945, p. 3). Unlike many of the members of that group, however, the present specimens

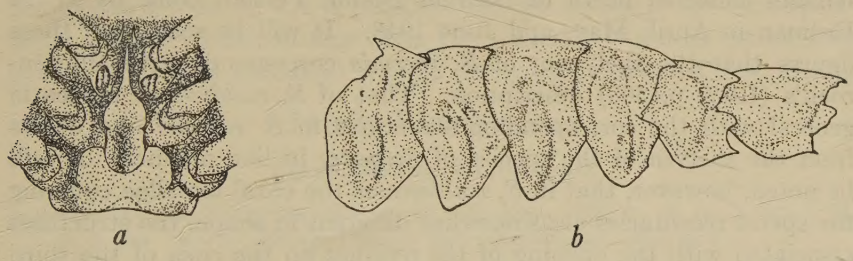

FIGURE 2.—*Sicyonia bispinosa* (de Haan)?: *a*, Thelycum, X 8.2; *b*, abdomen, X 7.6.

have the fifth abdominal somite terminating dorsally in a distinct tooth on each side.

Although it is probable that the Rongelap specimens are conspecific with the young male from the Sulu Archipelago that de Man called *S. bispinosa*, additional study of Japanese material must be made before they can certainly be assigned to de Haan's species.

Family Sergestidae

Subfamily Sergestinae

Sicyonella maldivensis Borradaile

Figure 3,*a*

Sicyonella maldivensis Borradaile, 1910, p. 259, pl. 16, figs. 3, 3a.—Calman, 1914, p. 258 (part), figs. a, b.—Hansen, 1919, p. 28, pl. 2, fig. 4,a–g.

Bikini Atoll: Northeast end of lagoon at *Bowditch* anchorage; surface light at night; Apr. 23, 1946; L. P. Schultz and J. P. E. Morrison; 1 female.—Same; Apr. 25, 1946; L. P. Schultz; 1 male, 1 female.

Although the petasma of the male specimen in the present collection has the proportions of certain of the parts slightly different from those in Calman's and Hansen's figures, the organ is structurally the same. As Burkenroad (1937, p. 507) has suggested, there are probably local forms of the species of *Sicyonella* which differ from each other in minor characters only.

The male has a carapace length of 6.0 mm. (total length, about 22.5 mm.); the females have carapace lengths of 6.6 and 7.8 mm. (total lengths, about 22.5 and 26.5 mm.).

Inasmuch as the thelyca of the species of *Sicyonella* have not been figured heretofore, this opportunity is taken to include a figure of this structure from one of the Bikini specimens (fig. 3,*a*), as well as one of a female of *Sicyonella inermis* (Paulson) (=*S. elegans* (Calman)) (fig. 3,*b*); the latter specimen is one of two males and six females collected north of Bahrein Island, Persian Gulf, by D. S. Erdman in April, May, and June 1948. It will be seen from these figures that the thelycum of *S. inermis* corresponds with Burkenroad's (1937, p. 508) description. That of *S. maldivensis* agrees in general with the corresponding structures in *S. inermis* and differs from the thelyca of the species of *Sergestes* in like manner. It will be noted, however, that in *S. maldivensis* the coxal lamallae covering the sperm receptacles are somewhat different in shape, the structures associated with the opening of the oviduct on the coxa of the third leg are unlike those in *S. inermis*, there is a prominent, bidentate structure immediately posterior to the coxa of this leg, and there is no median papilla on the anterior part of the 13th sternite as there is in *S. inermis*.

Subfamily Luciferinae

Lucifer faxoni Borradaile

Lucifer faxoni Borradaile, 1915, p. 228.—Hansen, 1919, p. 61, pl. 5, fig. 3,a–i.

Rongelap Atoll: One-half mile off Yugui Island in 13 fathoms; surface light at night; July 30, 1946; E. S. Herald; 3 males.

Lucifer sp. ?

Eniwetok Atoll: Southwest Passage, leeward side of reef two miles south of Rigili Island; surface light at night; May 24, 1946; L. P. Schultz; 1 male, 2 females.

These specimens belong to Hansen's Group B (1919, p. 56), but

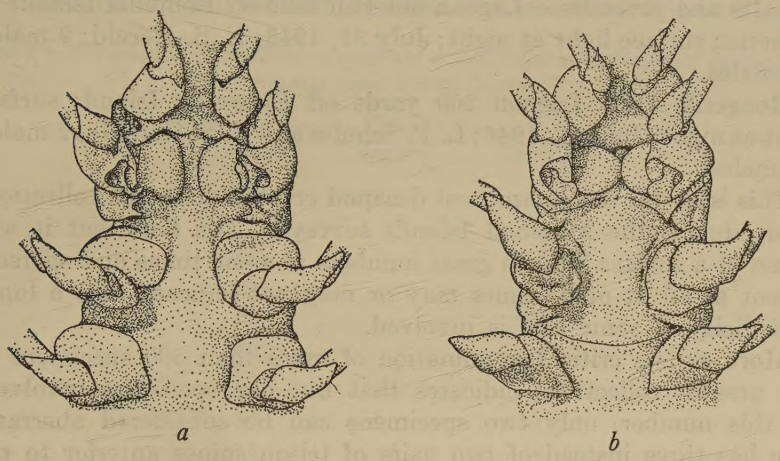

FIGURE 3.—Thelyca of species of *Sicyonella: a, S. maldivensis* Borradaile with a carapace length of 7.8 mm., X 13.6; *b, S. inermis* (Paulson) with a carapace length of 8.1 mm., X 13.6.

they do not correspond with any of the species so far known in that group. As a matter of fact, the petasma most nearly resembles that of *Lucifer orientalis* Hansen (1919, p. 55, pl. 4, fig. 7,a–g), which belongs to Group A. It is possible, though unlikely, that the specimens are immature; in any case, the material is not in sufficiently good condition or abundant enough to provide a detailed description.

Family PASIPHAEIDAE

Leptochela robusta Stimpson

Leptochela robusta Stimpson, 1860, p. 43.—de Man, 1920, p. 19, pl. 3, figs. 7–7j, pl. 4, figs. 7k–7x.—Kemp, 1925, p. 252.—Armstrong, 1941, p. 1.

Bikini Atoll: Northeast end of lagoon at *Bowditch* anchorage; surface light at night; Mar. 30, 1946; L. P. Schultz and V. E. Brock; 44 males, 97 females and juveniles (8 ovigerous).—Same; Apr. 23–25, 1946; L. P. Schultz and J. P. E. Morrison; 2,750 males and females.—Lagoon, four miles south of west end of Bikini Island; about 25 fathoms; sand and "Halimeda" bottom; Aug. 26, 1947; J. P. E. Morrison; 1 male.

Eniwetok Atoll: Lagoon off Eniwetok Island at *Bowditch* anchorage; surface light at night; May 23, 1946; L. P. Schultz; 4 males, 5 females.—Southwest Passage, leeward side of reef two miles south of

Rigili Island; surface light at night; May 24, 1946; L. P. Schultz; 10 males, 28 females and juveniles.—Lagoon; subtidal; June 6, 1946; M. W. Johnson; 1 female.

Rongelap Atoll: Lagoon one-half mile off Yugui Island; 13 fathoms; surface light at night; July 30, 1946; E. S. Herald; 33 males, 101 females and juveniles.—Lagoon one-half mile off Lomuilal Island; 13 fathoms; surface light at night; July 31, 1946; E. S. Herald; 2 males, 3 females.

Rongerik Atoll: Lagoon 200 yards off Eniwetak Island; surface light at night; June 28, 1946; L. P. Schultz and E. S. Herald; 12 males, 5 females.

This is by far the commonest decapod crustacean in the collections made during the Marshall Islands surveys. The fact that it was taken at a surface light in great numbers at some times and sparsely or not at all at other times may or may not indicate that a lunar periodicity of some sort is involved.

More or less critical examination of more than 500 specimens in the present collections indicates that but one species is involved. Of this number, only two specimens can be considered aberrant. One has three instead of two pairs of telson spines anterior to the terminal ones; the other specimen has two lateral spines on one side of the telson and only one on the other side. The collections would indicate, therefore, that the genus is represented by but a single species in the Marshalls area, whereas Armstrong (1941) found two (*L. robusta* and *L. aculeocaudata hainanensis*) in a collection from Samoa. It may be of interest that the specimens recorded from the Hawaiian Islands by Rathbun (1906, p. 929) are, as her description indicates, not *L. robusta;* they appear to belong to a species closely allied to, and possibly identical with, *L. aculeocaudata* Paulson. Considerable additional study of the Indo-Pacific species of *Leptochela* must be made before the various forms can be defined satisfactorily.

The dentition of the fingers of the second chela in 100 specimens selected at random from the lot taken in Bikini lagoon shows greater variation than has been evidenced heretofore (table 1). In general, the number of spines on the fingers appears to increase with the size of the specimen. The largest specimen critically examined, a female with a carapace length of 3.7 mm., has 54 spines on the fixed finger, whereas the smallest specimens have but 28 to 34 spines. Although the modal numbers of these teeth probably are of specific importance, especially when correlated with specimen size, it is apparent that the number is less sharply defined for each species than Kemp's diagnoses would indicate. The number of small spines in the intervals between the larger ones at the middle of the fingers may be of greater taxonomic importance, but here also there is considerable variation; in the speci-

mens examined, these numbers vary from three to nine, and appear to increase with specimen size.

The relative numbers of males and females in this collection do not bear out Armstrong's suggestion (1941, p. 1) that a submerged light may exert a greater attraction for males than for females. Including 89 males and 121 females and juveniles, of which 4 are ovigerous, that

TABLE 1.—*Variation in dentition on fingers of second chelae of specimens of* Leptochela robusta *from Bikini Lagoon*

Denticles	*Fixed fingers*	*Dactyls*
24	----------	1
25	----------	2
26	----------	2
27	----------	----------
28	1	2
29	----------	10
30	----------	2
31	2	12
32	1	13
33	1	11
34	1	10
35	6	11
36	3	12
37	8	6
38	10	2
39	8	2
40	11	1
41	10	1
42	7	----------
43	5	----------
44	10	----------
45	6	----------
46	4	----------
47	3	----------
48	1	----------
49	----------	----------
50	----------	----------
51	1	----------
52	----------	----------
53	----------	----------
54	1	----------

were sexed of the lot of 2,750 specimens taken in Bikini lagoon on April 23–25, the sexed individuals of the entire collection amount to 195 males and 361 females and juveniles, of which 12 are ovigerous. The small number of egg-bearing females suggests that the eggs usually are produced at some other season of the year or that ovigerous specimens are not attracted by a submerged light as are females without eggs.

Family Processidae

Nikoides sibogae de Man

Nikoides sibogae de Man, 1918, p. 160; 1920, p. 193, pl. 16, figs. 50–50j; 1922, p. 46.

Bikini Atoll; 1946; M. W. Johnson; 1 ovigerous female.

The single specimen has a carapace length, exclusive of the rostrum, of 4.2 mm. It agrees very well with de Man's description (1920) of the type specimen. The species appears to differ from *N. danae* Paulson, with which it was synonymized by Gurney (1937, p. 89), in the following particulars: The outer spine of the antennal scale falls far short of the end of the blade, rather than exceeding the blade as noted by Nobili (1906, p. 80) and Gurney; the third maxillipeds exceed the antennal scale by nearly or quite all of the two distal segments, not by little more than the terminal segment; the non-chelate first leg surpasses the antennal scale by the dactyl and most of the propodus, rather than by the dactyl alone; and the fourth legs extend beyond the antennal scale by the dactyl, propodus, and nearly all of the carpus, rather than by the dactyl and somewhat more than half of the propodus, as noted by Nobili in *N. danae*. Until more is known of the variation in the species, it seems best to retain de Man's name for this form with the longer and more slender appendages.

Nikoides nanus, new species

Figure 4

Eniwetok Atoll: Runit Island; intertidal; May 30, 1949; M. W. Johnson; 1 male holotype (USNM 94741).

Bikini Atoll: Namu Island; reef at shore inside lagoon; Apr. 3, 1946; M. W. Johnson; 1 male paratype.

Carapace armed with a prominent antennal spine extending well beyond the anterior margin; lower anterior angle of carapace rounded and armed with a marginal row of eight or ten long, slender spinules. Rostrum (fig. 4,*b*) small, reaching barely as far as the proximal ends of the eyestalks, and provided with a long, slender spinule on each side; these spinules seem to be set in a notch in the upper margin of the rostrum, but no true rostral tooth is apparent. Abdomen mostly smooth and bare on the first four somites, covered with an increasing number of slender spinules on the fifth and sixth somites and the telson, as well as on the inner uropods; sixth somite a little more than twice as long as fifth; pleura of both fifth and sixth somites armed with a sharp posterior tooth (fig. 4,*c*). Telson more than 1½ times as long as sixth somite, armed with two pairs of dorsal and three pairs of distal spines, in addition to the numerous spinules covering the surface (fig. 4,*d-e*).

Eyes very large, the cornea being nearly as wide as the combined lengths of the stalk and cornea (fig. 4,*a*). Antennular peduncle with the penultimate slightly longer than the distal segment (fig. 4,*a*,*f*);

FIGURE 4.—*Nikoides nanus*, new species, holotype: *a*, Frontal part in dorsal view, X 11; *b*, rostrum in lateral view, X 66; *c*, fifth and sixth abdominal somites in lateral view, X 10.6; *d*, telson and uropods in dorsal view, X 10.3; *e*, tip of telson, X 67.9; *f*, right antennule in dorsal view, X 10.6; *g*, right antennal scale in dorsal view, X 16.5; *h*, right mandible, X 33; *i*, right second maxilla, X 18.3; *j*, right first maxilliped, X 26.4; *k*, right second maxilliped, X 22; *l*, right third maxilliped, X 10.3; *m*, right first leg, X 10.3; *n*, left first leg, X 10.3; *o*, right second leg, X 10.3; *p*, left second leg, X 10.3; *q*, right third leg, X 10.3; *r*, right fourth leg, X 10.3; *s*, right fifth leg, X 10.3; *t*, endopod of right first pleopod, X 26.4; *u*, right second pleopod, X 26.4.

inner antennular flagellum about as long as combined lengths of carapace and first three abdominal somites; outer flagellum composed of about 17 segments, the first 12 of which are swollen. Antennal scale (fig. 4,*g*) about 6⅔ times as long as broad; the outer distal spine falls slightly short of the level of the distal end of the blade. Antennal peduncle reaching about as far as distal end of second antennular segment; antennal flagella more than 1½ times as long as body. Third maxillipeds (fig. 4,*l*) exceed antennal scale by slightly more than the two distal segments. Right leg of first pair (fig. 4,*m*) chelate and extending beyond the antennal scale by the length of the fingers and about one-half of the hand. Left leg of first pair (fig. 4,*n*) simple, overreaching antennal scale by the length of the dactyl and about three-fourths of the propodus. Exopods of the first legs small, extending little if at all beyond the ischium. Right leg of second pair (fig. 4,*o*) reaching beyond antennal scale by the lengths of the chela, carpus, and one-third of the merus; carpus divided into about 43 articulations and merus into about 15 less distinct ones. Left leg of second pair (fig. 4,*p*) overreaching antennal scale by chela and carpus; carpus composed of about 19 articulations and merus of about 6 indistinct ones. Third leg (fig. 4,*q*) extending beyond antennal scale by dactyl, propodus, and about one-half of carpus; fourth leg (fig. 4,*r*) by dactyl, propodus, and three-fourths of carpus; and fifth leg (fig. 4,*s*) by the dactyl and three-fourths of the propodus. The appendix masculina on the second pleopods reaches to the distal fifth of the endopod and bears four long spines on its obliquely truncate end (fig. 4,*u*).

The mouthparts are shown in figure 4,*h–k*. The first maxilla is apparently so reduced that its proper orientation could not be determined after it was removed.

The carapace of the holotype measures 2.5 mm. in length, and the entire animal is approximately 10 mm. long from the tip of the rostrum to the end of the telson. The paratype is about 10.5 mm. long and has a carapace length of 2.7 mm.

This species is apparently smaller than any of the previously known species of *Nikoides*. It is distinguished also by its smaller and differently formed rostrum, different proportions of the antennular peduncle, and shorter exopods on the first pair of legs. The latter character possibly strengthens Gurney's contention (1937, p. 89) that *Nikoides* is not a valid genus and can only be maintained as a matter of convenience; it seems best, however, to retain its identity for the present at least.

***Processa molaris*, new species**

FIGURE 5

Rongelap Atoll: Burok Island; intertidal coral; July 18, 1946; M. W. Johnson; 1 ovigerous female holotype (USNM 94763).

Bikini Atoll: Namu Island; reef at shore inside lagoon; April 3, 1946; M. W. Johnson; 3 female paratypes (2 ovigerous).

Carapace with the antennal angle acute but not spinous; lower anterior margin of carapace rounded and armed with a marginal row of about five plumose setae. Rostrum (fig. 5,*a*,*b*) not reaching as far as the ends of the eyes; it is simple, rather sharply upturned at the tip, and armed with a few movable dorsal spines in the distal fourth and with a stout seta inserted on each lateral surface just back of the tip. Abdomen mostly smooth and bare except for a few slender spinules or stout setae on the fifth and sixth somites, as well as on the telson and inner uropods; sixth somite about one-third again as long as fifth; pleuron of fifth somite rounded, that of sixth somite armed with a posterior tooth (fig. 5,*c*). Telson fully 1¾ times as long as sixth somite, armed with two pairs of dorsal and three pairs of distal spines (fig. 5,*d*,*e*).

Eyes not large, the cornea little if any wider than the stalk (fig. 5,*a*). Antennular peduncle with the penultimate distinctly shorter than the distal segment (fig. 5,*f*); outer flagellum composed of 13 segments, the first 10 of which are swollen. Antennal scale (fig. 5,*g*) slightly more than three times as long as broad; the outer distal spine falls short of the end of the blade. Antennal peduncle reaching about as far as the distal end of the second antennular segment; antennal flagella somewhat longer than the body. Third maxillipeds (fig. 5,*m*) extend beyond antennal scale by slightly more than the length of the distal segment. Right leg of first pair (fig. 5,*n*) chelate and reaching about to end of antennal scale. Left leg of first pair (fig. 5,*o*) simple and also reaching about as far as end of scale. Right leg of second pair (fig. 5,*p*) reaches beyond antennal scale by the chela and about one-third of the carpus; carpus divided into six articulations, the proximal two of which are obscure; merus undivided. Left leg of second pair (fig. 5,*q*) slightly longer than the right, but otherwise similar to it. Third leg (fig. 5,*r*) overreaches antennal scale by sightly more than the dactyl and propodus; fourth leg (fig. 5,*s*) by the dactyl, propodus, and about one-third of the carpus; and the fifth leg (fig. 5,*t*) by little more than the dactyl.

The mouthparts are shown in figure 5,*h*–*l*. The most unusual feature of these appendages is the relatively enormous size of the

mandible; this can be appreciated by comparing the figures of the mandible and of the antennal scale, which are drawn to the same scale. The basal portion of the mandible is so large that it occupies a considerable portion of the branchial cavity; it is plainly visible as a large subspherical structure lying beneath the anterolateral portion of the carapace.

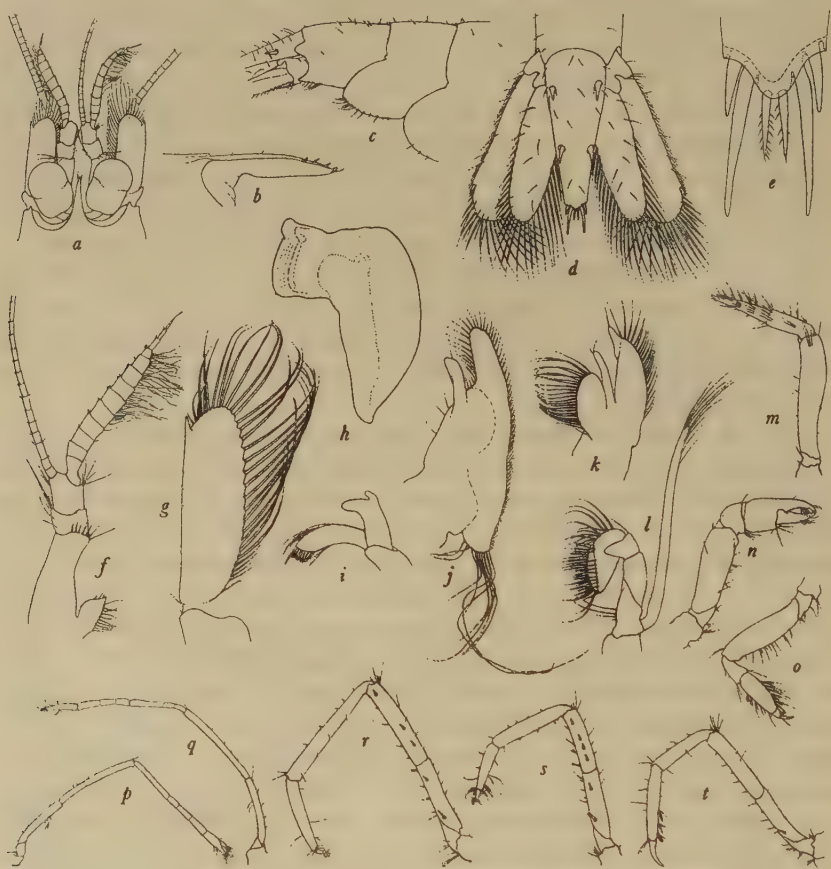

FIGURE 5.—*Processa molaris*, new species: *a*, Frontal part of holotype in dorsal view, X 11; *b*, rostrum of holotype in lateral view, X 24.5; *c*, fifth and sixth abdominal somites of paratype in lateral view, X 17.9; *d*, telson and uropods of paratype in dorsal view, X 17.1; *e*, tip of telson of paratype, X 73; *f*, right antennule of holotype in dorsal view, X 18.3; *g*, left antennal scale of holotype in dorsal view, X 25.2; *h*, left mandible of holotype, X 25.2; *i*, left first maxilla of paratype, X 25.2; *j*, left second maxilla of paratype, X 25.2; *k*, left first maxilliped of holotype, X 25.2; *l*, left second maxilliped of holotype, X 25.2; *m*, left third maxilliped of holotype, X 11; *n*, right first leg of holotype, X 11; *o*, left first leg of holotype, X 11; *p*, right second leg of holotype, X 11; *q*, left second leg of holotype, X 11; *r*, left third leg of holotype, X 11; *s*, left fourth leg of holotype, X 11; *t*, left fifth leg of holotype, X 11.

The carapace of the holotype measures 2.0 mm. in length, and the entire animal is approximately 8.5 mm. long. The carapace lengths of the paratypes vary from 1.7 to 2.0 mm.

This species is probably closely related to *Processa coutieri* Nobili, the only other species of the genus with the carpus of the second legs 6-jointed. It differs from Nobili's descriptions and figures (Nobili, 1904, p. 234; 1906, p. 78, pl. 4, figs. 3, 3a) in having the rostrum shorter rather than longer than the eyes; in having the first antennular segment much longer rather than shorter than the two following segments; and in having the telson armed distally with three pairs of spines (the median pair plumose) rather than two pairs of spines and some long plumose hairs. It is very possible that Nobili's description is in error as far as the last two characters are concerned, but the difference in rostral length is so great that it seems advisable to keep the two forms distinct at least until the type of *P. coutieri* can be reexamined.

Family Thalassocaridae

Thalassocaris crinita (Dana)

Figure 6

Regulus crinitus Dana, 1852, p. 599; 1855, pl. 39, figs. 6a–h.
Thalassocaris crinita de Man, 1920, p. 95, pl. 9, figs. 22–22o.—Armstrong, 1941, p. 5.

Bikini Atoll: Eastern end of lagoon; 30–33 fathoms, coral bottom; Mar. 29, 1946; L. P. Schultz; 1 male, 5 females (3 ovigerous).

Rongelap Atoll: Lagoon; 23 fathoms; June 16, 1946; M. W. Johnson; 2 ovigerous females.

The single male in this collection has a carapace length of 5.1 mm. This measurement in the females varies from 3.0 to 5.4 mm., ovigerous specimens having the carapace from 4.1 to 5.4 mm. long.

Family Alpheidae

Automate johnsoni, new species

Figure 7

Bikini Atoll: May 1946; M. W. Johnson; 1 male holotype (USNM 94746).—Bokonfuaaku Island; intertidal in potholes; May 16, 1946; M. W. Johnson; 1 ovigerous female paratype.—Enirik Island; intertidal; 1946; M. W. Johnson; 1 juvenile.

Eniwetok Atoll: Bogombogo Island; intertidal; May 31, 1946; M. W. Johnson; 1 male paratype.

Rostrum (fig. 7,*a*) triangular and prominent, but not reaching as far forward as anterior margin of carapace; no lateral grooves on

carapace at base of rostrum. Carapace and abdomen smooth, polished, and unarmed. Fifth and sixth abdominal somites subequal in length. Telson (fig. 7,*b*) about 1.15 times as long as sixth somite, armed dorsally with two pairs of spines and, distally, with two pairs of spines and three pairs of plumose setae, as well as about a dozen long, simple setae directed upward and backward from the posterior margin. The telson of the male paratype from Bogombogo Island is obviously aberrant in that it lacks the anterior dorsal spine on the

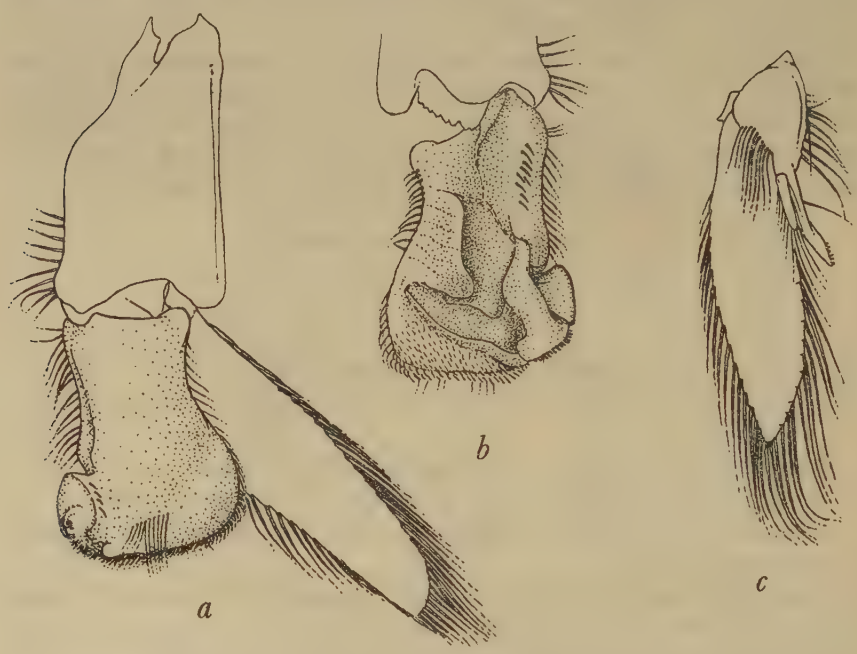

FIGURE 6.—*Thalassocaris crinita* (Dana): *a*, First pleopod of male in posterior view, X 25.3; *b*, endopod of first pleopod of male in anterior view, X 25.3; *c*, endopod of second pleopod of male in anterior view, X 25.3.

right side and has two smaller additional spines (one marginal and one submarginal) on that side between the posterior dorsal tooth and the posterior margin.

Antennular peduncle (fig. 7,*c*) with penultimate more than twice as long as distal segment and not quite 2½ times as long as wide; tip of stylocerite reaching slightly beyond distal margin of proximal segment; inner antennular flagellum somewhat longer than carapace and first abdominal somite; outer flagellum with the first 12 or 13 segments swollen. Antennal scale (fig. 7,*d*) reaching to distal fourth or fifth of penultimate antennular segment. Antennal peduncle slightly over-

reaching antennular peduncle; antennal flagellum nearly as long as carapace and first four abdominal somites. Third maxillipeds (fig. 7,*j*) extend beyond antennal scale by slightly more than terminal segment. First legs (fig. 7,*k*,*l*) exceed antennal scale by about the length of the chela. Second legs (fig. 7,*m*) reach beyond scale by chela, carpus, and one-fourth of merus. Third legs (fig. 7,*n*) exceed antennal scale by dactyl and three-fourths of propodus; fourth legs

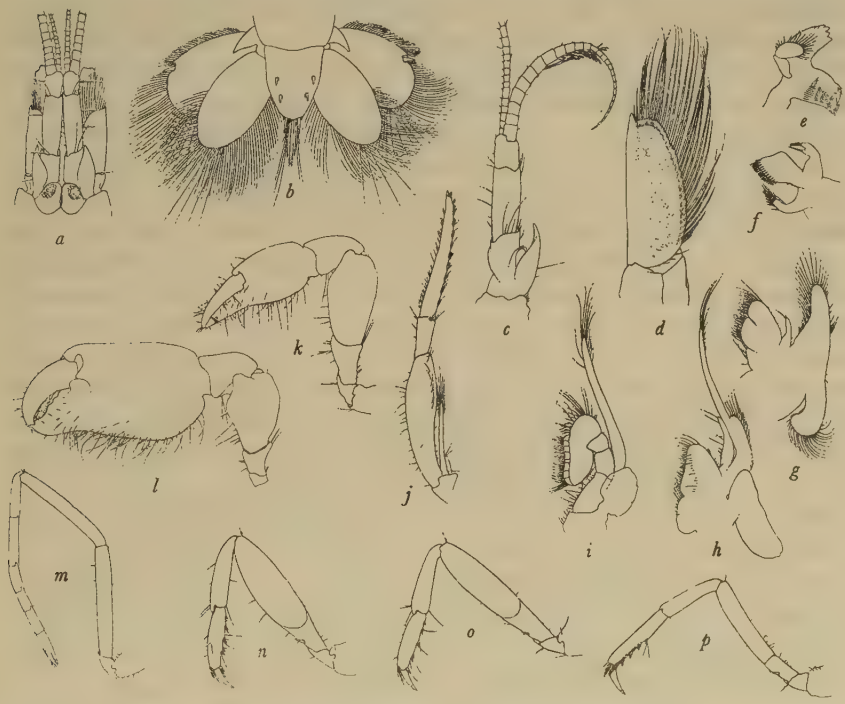

FIGURE 7.—*Automate johnsoni*, new species: *a*, Frontal part of male paratype in dorsal view, X 6.2; *b*, telson and uropods of holotype in dorsal view, X 8.4; *c*, right antennule of holotype in dorsal view, X 11; *d*, left antennal scale of holotype in dorsal view, X 19.8; *e*, left mandible of holotype, X 14.3; *f*, left first maxilla of holotype, X 14.3; *g*, left second maxilla of holotype, X 14.3; *h*, left first maxilliped of holotype, X 14.3; *i*, left second maxilliped of holotype, X 14.3; *j*, left third maxilliped of holotype, X 7; *k*, left first leg of holotype, X 7; *l*, left first leg of female paratype, X 5.1; *m*, left second leg of holotype, X 7; *n*, left third leg of holotype, X 7; *o*, left fourth leg of holotype, X 7; *p*, left fifth leg of holotype, X 7.

(fig. 7,*o*) by dactyl and one-fourth of propodus; and fifth legs (fig. 7,*p*) by nearly the length of the dactyl.

Mouthparts are shown in figure 7,*e*-*i*.

The ovigerous female paratype differs from the two adult males in having the antennular peduncles slightly more slender, the stylocerite slightly shorter and therefore not perceptibly overreaching the proximal antennular segment, and the antennal scales slightly shorter,

in addition to the sexual differences involving the outer antennular flagellum and the first chela noted by Coutière (1905, p. 855) in *A. gardineri* and *A. dolichognatha.*

In the immature specimen from Enirik Island, the antennular segments are much more robust and there are but six or eight swollen segments in the outer antennular flagellum.

The male holotype is approximately 12 mm. long and has a carapace length of 3.6 mm. The male paratype from Bogombogo Island has a carapace length of 4.7 mm., the ovigerous female from Bokonfuaaku Island has the carapace 3.9 mm. long, and the immature individual from Enirik Island has a carapace length of 1.8 mm.

This species is closely related to, if not identical with, *A. gardineri* Coutière. It differs from Coutière's description and figures (1905, p. 854, figs. 127, 128), as well as from a Siamese specimen tentatively identified as *A. gardineri* by W. L. Schmitt (Suvatti, 1938, p. 47), in the following particulars: the rostrum is triangular rather than rounded and is not delimited laterally by grooves on the carapace; the antennular peduncle is stouter, the penultimate segment being about 2½ rather than 4 or more times longer than wide; the stylocerite is slightly longer, usually overreaching rather than falling short of the end of the proximal segment; and the antennal scale reaches nearly or quite to the distal fifth of the penultimate antennular segment rather than extending but little beyond the middle of that segment. All these distinctions may prove to be unimportant when additional material becomes available, but it seems advisable for the present to consider the Marshall Islands form distinct, in order to stress the differences. The species is close to *Automate* sp. de Man (1911b, p. 140, pl. 1, figs. 2–2d), but whether any or all of these forms are distinct must remain for later workers to decide.

Athanas djiboutensis Coutière

Athanas djiboutensis Coutière, 1897, p. 234; 1905, p. 856, fig. 129.—Tattersall, 1921, p. 368.

Bikini Atoll: Namu Island; reef inside lagoon; Apr. 3, 1946; M. W. Johnson; 1 male.—Same; April 4, 1946; 2 ovigerous females.—Bokonfuaaku Island; intertidal potholes; May 16, 1946; M. W. Johnson; 1 male, 1 ovigerous female.—Enirik Island; intertidal; 1946; M. W. Johnson; 2 males.

Eniwetok Atoll: Bogen Island; intertidal potholes; May 21, 1946; M. W. Johnson; 1 male.—Bogombogo Island; intertidal; May 31, 1946; M. W. Johnson; 1 ovigerous female.

Rongelap Atoll: Eniaetok Island; intertidal potholes; June 16, 1946; M. W. Johnson; 1 male.—Burok Island; intertidal coral; July 18, 1946; M. W. Johnson; 1 ovigerous female.

These specimens agree very well with Coutière's description and figures except that the rostrum reaches at most as far as the end of the second antennular segment and frequently is slightly shorter. The males have carapace lengths of from 1.4 to 2.3 mm. and the ovigerous females from 1.5 to 2.2 mm. In the smallest male, from Enirik Island, Bikini Atoll, the left first cheliped is very small and similar to the minor cheliped of the female; the right cheliped in this specimen is lacking. It is not possible to tell from the material at hand whether this anomaly is due to the immaturity of the specimen or whether it is indicative of polymorphism in the males of this species as suggested by Tattersall. Only two of the remaining five males in the collection retain the major cheliped, and in both of these it is as figured by Coutière. Three of these males have the minor cheliped; it agrees with Coutière's figure, except that the merus is noticeably broader. In the three females in which the major cheliped is intact, it corresponds with Coutière's figure except that the fingers are crossed at the extreme tips.

Athanas marshallensis, new species

FIGURE 8

Eniwetok Atoll: Bogombogo Island; intertidal; May 31, 1946; M. W. Johnson; 1 male holotype, 9 male and 9 ovigerous female paratypes.

Bikini Atoll: Namu Island; outside reef; Apr. 4, 1946; M. W. Johnson; 1 male paratype.

Rongelap Atoll: Tufa Island; lagoon side, under rocks; July 16, 1946; M. W. Johnson; 2 ovigerous female paratypes.

Carapace and abdomen sparsely pubescent. Rostrum (fig. 8,*a*,*b*) reaching slightly beyond middle of second antennular segment, with a dorsal carina on the anterior two-thirds of its length. No supracorneal spines. Extracorneal tooth prominent and sharp, but falling well short of anterior margin of cornea. Infracorneal tooth small and blunt, not reaching nearly as far as extracorneal. Anterolateral margin of carapace rounded, unarmed. Sixth abdominal somite slightly longer than fifth (fig. 8,*c*); posterior angle of pleuron of fifth somite acute. Telson (fig. 8,*c*–*d*) nearly 1¼ times as long as sixth somite and 2.7 times as long as its distal margin; it is armed with the usual two pairs of dorsal and two pairs of distal spines, with numerous marginal setae between the two sets of distal spines.

Antennular peduncle (fig. 8,*e*) with distal segment about one-third again as long as penultimate; stylocerite extending slightly beyond penultimate segment; outer antennular flagellum divided at third joint, the inner branch probably composed of three segments, each of which appears to be subdivided so that this branch has the appearance

FIGURE 8.—*Athanas marshallensis*, new species: *a*, Frontal part of holotype in dorsal view, X 8; *b*, frontal part of holotype in lateral view, X 8; *c*, posterior part of abdomen of holotype in lateral view, X 8; *d*, telson and uropods of holotype in dorsal view, X 8.4; *e*, left antennule of holotype in dorsal view, X 11.3; *f*, left antennal scale of holotype in dorsal view, X 13.9; *g*, left mandible of holotype, X 13.9; *h*, left first maxilla of holotype, X 13.9; *i*, left second maxilla of holotype, X 13.9; *j*, left first maxilliped of holotype, X 13.9; *k*, left second maxilliped of holotype, X 13.9; *l*, left third maxilliped of holotype, X 9.8; *m*, right first leg of holotype in posterior view, X 9.8; *n*, left first leg of holotype in posterior view, X 9.8; *o*, right first leg of holotype in anterior view, X 9.8; *p*, first legs of ovigerous female paratype in posterior view, X 9.8; *q*, left second leg of holotype, X 9.8; *r*, left third leg of holotype, X 9.8; *s*, left fourth leg of holotype, X 9.8; *t*, right fifth leg of holotype, X 9.8; *u*, left first pleopod of holotype, X 25.2; *v*, left second pleopod of holotype, X 25.2.

of being 6-jointed. Antennal scale (fig. 8,*f*) reaching about to end of antennular peduncle, the outer spine reaching barely as far as distal margin of blade. Antennal peduncle reaching to about middle of distal antennular segment. Third maxillipeds (fig. 8,*l*) barely overreaching antennal scale. First and second legs with a rudimentary exopod as in some, if not all, other species of *Athanas*. First legs in adult male (fig. 8,*m–o*) little unequal, extending beyond antennal scale by about one-fifth of the merus; coxa armed with a strong, sharp spine anteriorly. First legs in female (fig. 8,*p*) with merus and chela subequal in length and about 1.3 times as long as carpus. Second legs (fig. 8,*q*) reaching nearly to end of antennal scale; carpus with first joint slightly longer than other four together, second, third, and fourth subequal and each less than one-half as long as fifth. Third legs (fig. 8,*r*) extending beyond antennal scale by length of dactyl; fourth legs (fig. 8,*s*) reaching just about to end of scale; and fifth legs (fig. 8,*t*) extending to about middle of antennal scale. Dactyls of last three legs simple, not biunguiculate.

The mouthparts are as shown in figure 8,*g–k*.

Most of the males in this collection lack one or both of the first pair of legs, so that it is not certain whether these legs are sometimes strikingly asymmetrical or not. In all males having carapace lengths from 2.5 to 2.7 mm., however, the remaining leg, if present, is small, approaching the condition in the female. At a carapace length of 2.9 mm. the remaining leg is of intermediate size. One larger male, with a carapace length of 3.1 mm., has both legs large but somewhat more asymmetrical than in the type.

The male holotype is approximately 10 mm. long and has a carapace length of 3.1 mm. The other males from the type locality have carapace lengths of from 2.5 to 3.7 mm., the ovigerous females from 2.5 to 3.2 mm. The male from Namu Island, Bikini Atoll, has a carapace length of 3.4 mm., and the ovigerous females from Tufa Island, Rongelap Atoll, have carapace lengths of 3.4 and 3.5 mm.

This species is named with some hesitation because of the numerous similar forms now known from the Indo-Pacific region. All of the specimens differ uniformly in certain particulars from previous descriptions, however. The present form differs as follows from those species in which the supracorneal spines are lacking and the dactyls of the last three pairs of legs are simple: From *A. crosslandi* Tattersall, 1921, it is distinguished by the shorter rostrum and extracorneal teeth and the longer stylocerite. From *A. dimorphus* Ortmann, 1894, by the shorter stylocerite and shorter and more robust appendages. From *A. esakii* Kubo, 1940, by the longer stylocerite and much smaller

infracorneal tooth. From *A. haswelli* Coutière, 1908, by the shorter carpus of the first legs in the female. From *A. japonicus* Kubo, 1936, by the slightly shorter rostrum, the absence of a dorsal carina behind the rostrum, smaller infracorneal tooth, longer stylocerite, shorter outer spine on the antennal scale, and more robust appendages. From *A. lamellifer* Kubo, 1940, by its much shorter rostrum and shorter and stouter appendages. From *A. minikoensis* Coutière, 1903, by the blunt, rather than sharp, infracorneal tooth and by the carpus of the first leg in the female being more than one-half as long as the merus; the specimens assigned to this species by de Man (1911b, p. 149) have the infraorbital tooth blunt as in *A. marshallensis*, but the telson is 3.8 rather than 2.7 times as long as the width of its posterior margin and the stylocerite is slightly shorter than in

TABLE 2.—*Length to width proportions of the leg segments in females of* Athanas marshallensis (*italics*) *and* A. stebbingii.

	Merus		*Carpus*		*Propodus*	
Right first leg	*4.3*	5.9	*3.2*	5.0		
Left first leg	*4.3*	6.1	*3.0*	5.5		
Third leg	*3.8*	5.2	*3.2*	4.2	*6.6*	9.3
Fourth leg	*3.9*	4.8	*3.3*	3.6	*6.7*	8.7
Fifth leg	*3.8*	4.8	*4.0*	3.8	*6.4*	8.7

A. marshallensis. From *A. orientalis* Pearson, 1905, by the slightly shorter rostrum and shorter extracorneal and, especially, infracorneal teeth. From *A. ohsimai* Yokoya, 1936, by the longer antennal scale, less massive movable finger of the first cheliped in the male, and shorter fingers of the first cheliped in the female. From *A. polymorphus* Kemp, 1915, by the absence of a pterygostomian tooth and more robust appendages. From *A. tenuipes* de Man, 1910, by the more robust appendages and much broader telson. *A. marshallensis* appears to be most closely allied to *A. stebbingii* de Man, 1920, described from a single ovigerous female from the Java Sea, but it differs from the description and figures of that species (de Man, 1922, p. 18, pl. 2, figs. 10–10a, pl. 3, figs. 10b–f) by its somewhat broader telson and stouter appendages; the telson in *A. marshallensis* is 1.5 times as long as its basal width and 2.7 times as long as its distal width, while the corresponding figures for *A. stebbingii* are 1.7 and 3.4 mm., respectively; the above table shows the proportions of the leg segments in *A. marshallensis* compared with those computed from de Man's measurements of the type of *A. stebbingii*.

Athanas areteformis Coutière

Athanas areteformis Coutière, 1903, p. 79, figs. 17,18; 1905, p. 860, fig. 132.

Bikini Atoll: Namu Island; outside reef; Apr. 4, 1946; M. W. Johnson; 1 male.

This specimen has a carapace length of 2.2 mm. Although it lacks all of the thoracic legs except the second and fifth on the right side, it agrees in all other particulars with Coutière's description and figures.

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